REMOTE HOME SURVEILLANCE USING ANDROID – PLATFORM PHONE THROUGH TCP / IP

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REMOTE HOME SURVEILLANCE USING ANDROID – PLATFORM PHONE THROUGH TCP/IP

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Submitted to the Faculty of Electrical Engineering

In partial fulfillment of the requirement for the degree of

Bachelor in Engineering (Computer)

Faculty of Electrical Engineering

Universiti Teknologi Malaysia

May 2011

“I declare that this work as the product of my own effort with the exception of excerpts cited from other works of which the sources were duly noted.”

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Name of Author : Muhammad Affandy Bin Azman

Date : …….

For my parent, teachers, and friends.

And for the readers, may you gain inspirations as I did in seeking knowledge…

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ABSTRACT

The safety of our home and our family should be a priority nowadays. With all the crime and accidents around us, it is important to equip ourselves with home security to ensure the safety of our home. However, security system alone isn't enough to ease our mind. Being able to monitor our home remotely from anywhere is a must feature to relieve the curiosity and worry regarding our home. This project is concerned for this kind of situation and creating this program is easy by just purchasing an IP camera and the rich features of open source Android –platform phone. Just by using open source tools like JSF programming and Android client programming, one can create a software with ease with only sufficient knowledge about networking.

ABSTRAK

Dewasa ini, keselamatan kediaman dan keluarga tersayang haruslah diutamakan. Dengan segala jenis jenayah dan kemalangan yang sering berlaku di sana - sini, kita haruslah melengkapkan diri dengan sistem yang dapat memastikan keselamatan kediaman kita. Walaubagaimanapun, sistem keselamatan sahaja tidak memadai untuk membuatkan fikiran kita tenang. Dengan kebolehan untuk mengawasi/melihat kediaman kita dari mana – mana merupakan satu ciri yang perlu ada untuk menghilangkan rasa gelisah dan risau berkenaan kediaman kita. Projek ini adalah berkaitan dengan situasi yg diterangkan dan membina program ini amat mudah dengan hanya membeli sebuah kamera IP bersama dengan telefon bimbit Android yang serba boleh. Hanya dengan menggunakan peralatan dari sumber yang terbuka seperti pengaturcaraan JSF dan pengaturcaraan klien Android, seseorang mampu membina perisian ini dengan mudah, dengan hanya memiliki sedikit ilmu berkaitan rangkaian.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF FIGURES	viii
	LIST OF APPENDICES	ix
1	**INTRODUCTION**	1
	1.1 Background	1
	1.2 Objective	2
	1.3 Scope	2
	1.4 Outline of thesis	3
	1.5 Summary of work	3
2	**THEORY AND LITERATURE REVIEW**	5
	2.1 Introduction	5
	2.2 Android	5
	2.2.1 Android Architecture	6
	2.2.2 Android Applications	6
	2.2.3 Android Libraries	7
	2.3 IP camera	8
	2.3.1 IP camera HTTP command	9
	2.4 DDNS	9
3	**METHODOLOGY**	11
	3.1 Introduction	11
	3.1.1 Conceptual Architecture	11
	3.1.2 System Architecture	12
	3.1.3 Software Architecture	12
	3.2 NetBeans	13
	3.2.1 Java web application (JSF) using NetBeans	13
	3.3 Eclipse	19
	3.3.1 Android Programming using Eclipse	19

	3.4	Server – Router Port-Forwarding	20
	3.5	Using DDNS for Dynamic IP	20
4	**RESULT AND DISCUSSION**		21
	4.1	Introduction	21
	4.2	Display	21
		4.2.1 Main Client Interface (Login)	21
		4.2.2 Home Screen	22
		4.2.3 Live View	23
	4.3	Image Captures	24
	4.4	Target Deployment	25
5	**CONCLUSION AND RECOMMENDATION**		27
	5.1	Conclusion	27
	5.2	Problems	28
	5.3	Recommendation	28
	REFERENCES		30
	APPENDICES		
		Appendix A: PSM 1 Gantt Chart	32
		Appendix B**:** PSM 2 Gantt Chart	34
		Appendix C: JSF Codes	36
		Appendix D: Android Programming	42
		Appendix E: Sample IP Camera Command	44
		Appendix F: User Manual	51
		Appendix G: Video Demonstration	57
		Appendix H: Technical Report	58

LIST OF FIGURES

Figures no.	Title	Page
1.5	Project Flow Chart	4
2.2.1	Android Architecture	6
3.1.1.1	Conceptual Architecture	11
3.1.2.1	System Architecture	12
3.1.3.1	Software Architecture	12
3.2.2.1	Server Flowchart	18
4.2.1.1	Main Client Interface (Login)	21
4.2.1.2	Main Client Interface (Login) Mobile	21
4.2.2.1	Home Screen	22
4.2.2.2	Home Screen Mobile	23
4.2.3.1	Live View	23
4.2.3.2	Live View Mobile	24
4.3.1	Image Interval	25
4.4.1	House Overview	25
4.4.2	House (Indoor)	26

LIST OF ABBREVIATION

TCP/IP	Transmission Control Protocol/Internet Protocol
JSF	Java Server Faces
HTTP	Hypertext Transfer Protocol
DDNS	Dynamic Domain Name System
SMS	Short Messaging Service
IDE	Integrated Development Environment
ADB	Android Debug Bridge
BSD	Berkeley Software Distribution
USB	Universal Serial Bus
JSP	Java Server Pages
RHS	Remote Home Surveillance
3G	Third Generation Mobile Telecommunications
DSL	Digital Subscriber Line
SDK	Software Development Kit
UI	User Interface
ISP	Internet Service Provider
GPRS	General Packet Radio Service

LIST OF APPENDICES

APPENDICES	TITLE	PAGE
A	PSM 1Gantt Chart	32
B	PSM 2 Gantt Chart	34
C	JSF Codes	36
D	Android Programming	42
E	Sample IP Camera Command	44
F	User Manual	51
G	Video Demonstration	57
H	Technical Report	58

CHAPTER 1

INTRODUCTION

1.1 Background

Nowadays, our neighborhood isn't as safe as it was before. Crime and accidents happen almost all the time. The safety of our family and homes should be prioritized. One of the most reliable ways in protecting ourselves and our family is to equip our home with a surveillance system that will allow us to monitor the situation of certain key places. By equipping our home with a surveillance system we can prevent any burglary, accidents, injury that may happen which is very essential in making our home safe.

In order to use the surveillance system more effectively, the placement and the position of the camera is very vital. The cameras should be placed in strategic locations around the perimeters of our house. It is also important to be able to view our home remotely wherever we are. Whether we are taking a family trip to somewhere far, going back to our hometown or even in the office, we can have the calm of heart by assuring there is nothing wrong.

Android is an open-source operating system for a mobile phone which have rich features in term of applications. By creating a remote home surveillance system by using Android-platform phone, it can be assured that every features needed in the home surveillance is possible.

A computer in our home will acts as a server and also to communicate with the camera. The server and camera which are connected in a Local Area Network through a router can be accessed remotely from outside using TCP/IP.

1.2 Objective

The objective that had been stated in finishing this project is:

- To design a system where users are able to view their homes remotely from an Android – platform phone through a TCP / IP network.

1.3 Scope

The scope of work for this project was to research and study on Android app programming, Java Web Application Server (JSF), and the IP camera protocol (HTTP). The Surveillance camera type used is an IP camera connected to a router. The surveillance client is Android-Platform Phone where the application is running on JAVA. The surveillance system was deployed in a home.

1.4 Outline of Thesis

This thesis is divided into five chapters. The first chapter provides an overview of the project, such as the introduction of the project itself, problem statements as well as the main objective.

Chapter 2 discusses more on literature reviews and theories research that had been done and a quick review on Android Operating System by Google, the JAVA Web Application Server (JSF), and the importance of surveillance camera to monitor our home.

Methodology and analysis are explained and elaborated in Chapter 3. The preparation to develop the server and the client along with the network connection between those two are described in this chapter. The flow charts and certain portion of the codes and the descriptions were drawn and provided also in this chapter.

Chapter 4 is filled with result and discussions. Screenshots of the interface from the Android Phone itself will be provided along with the actual snapshot of the picture generated from the camera.

Last but not least, Chapter 5 discusses the conclusion of this project and other future works that can be done to tremendously improve this project along with the references

1.5 Summary of Work

The overall project works were graphically summarized in the flow chart shown in Figure 1.5.

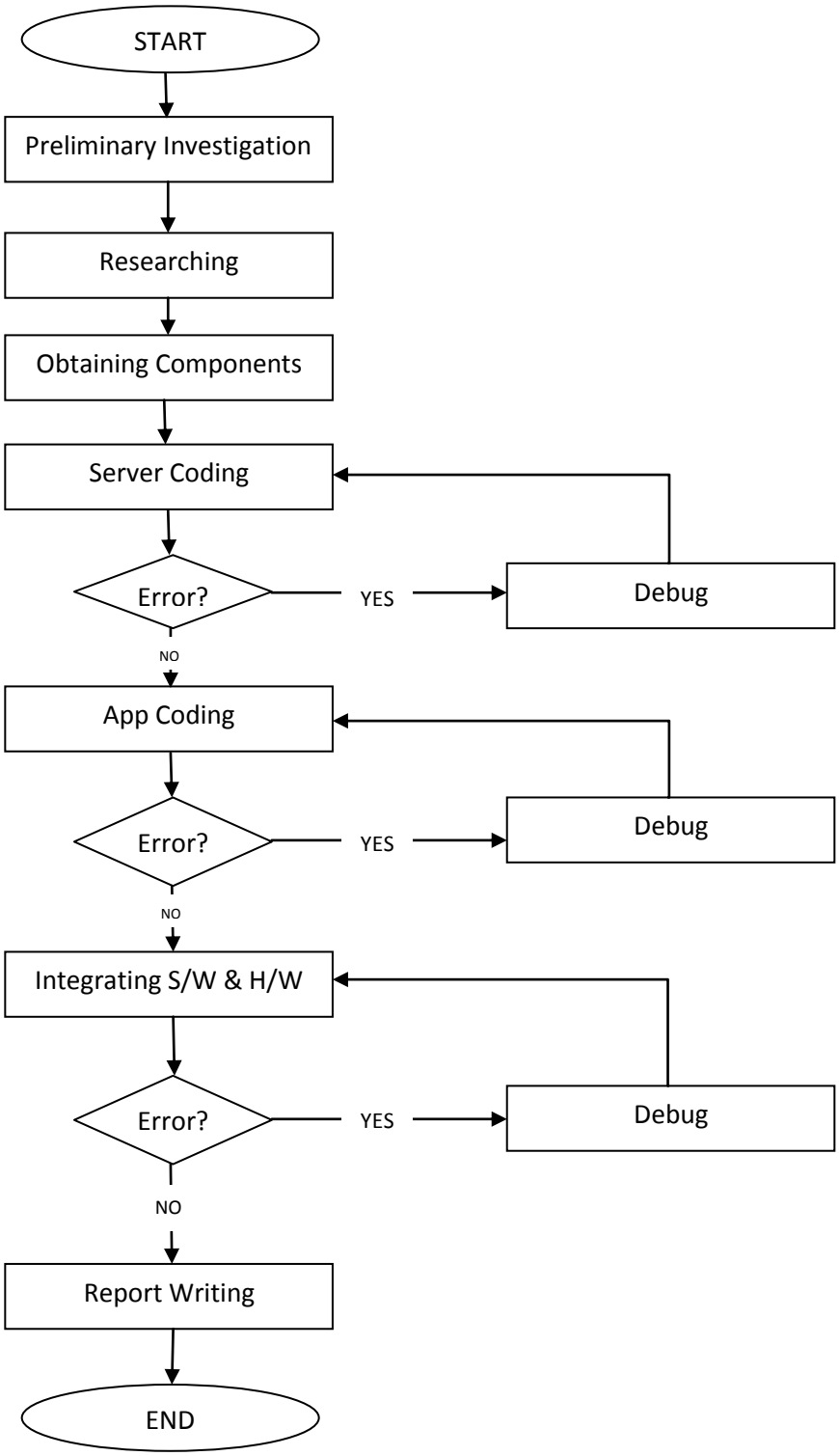

Figure 1.5: Project Flow Chart

CHAPTER 2

THEORY AND LITERATURE REVIEW

2.1 Introduction

This chapter discusses on the terms that are not familiar and the resources used in this project. Unfamiliar terms such as Android, DDNS, IP Camera and JSF and for the resources that were used is JAVA language and Glassfish server.

2.2 Android

Android is an open-source operating system for mobile phone which is developed by Google and is based upon Linux kernel and GNU software. Google provides developers an open development platform, which allows the developers the ability to create extremely rich and innovative applications. Developers are free to gain access to the device hardware, location information, run background services/multi-tasking, set alarms, adds notifications to the status bar and much more. [1]

2.2.1 **Android Architecture**

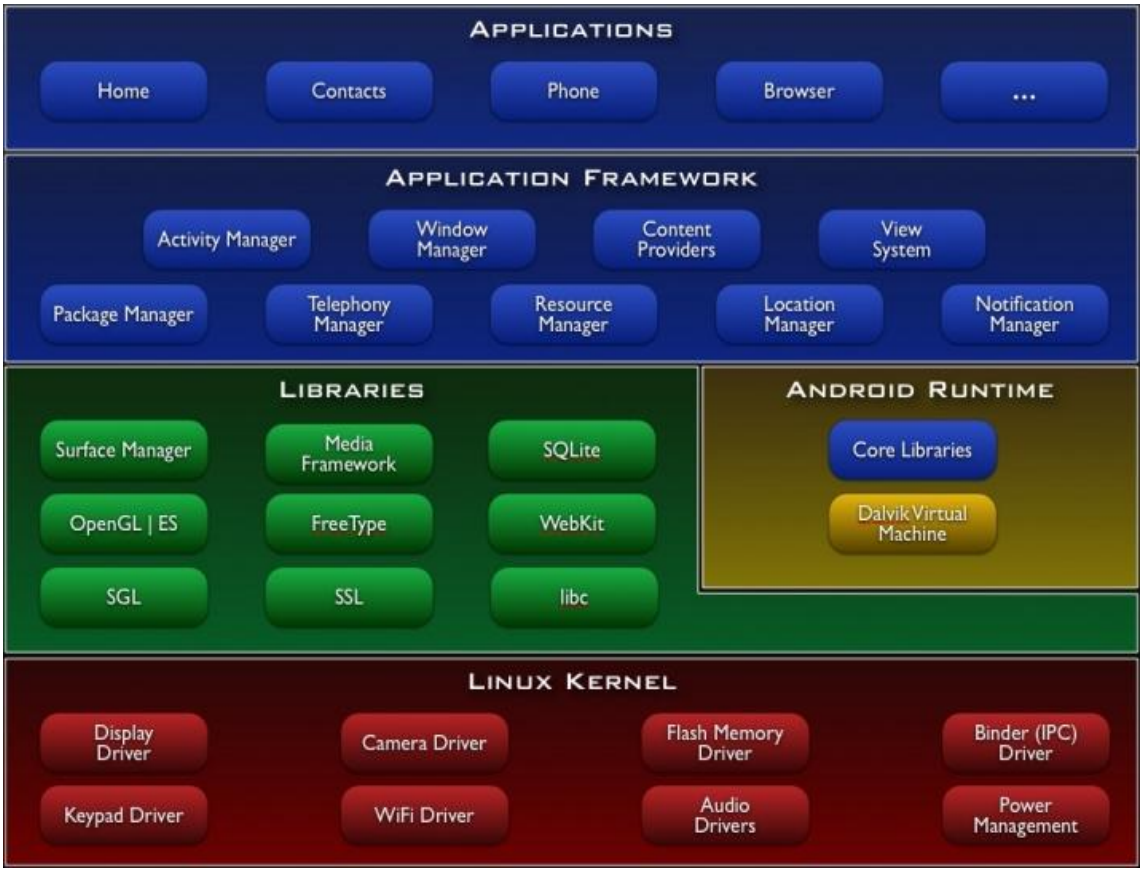

Figure 2.2.1: Android Architecture [1]

2.2.2 **Applications**

The Android system itself includes several applications such as SMS, Call, Browser, Calendars, and others. Android applications are written using JAVA. There are several IDE which integrates with Android programming such as Eclipse with ADB features. The feature enables the developer to connect with their Android phone (which debugging mode is enabled) to instantly debug and run the application on the phone. [1]

The services and system that is underlying all the applications in Android includes: [1]

1. Views – a large resource used to build an application which includes lists, buttons, text boxes and embeddable web browser.
2. Content Providers – enabling application to access data from other applications in the phone such as Contacts.
3. Resource Manager – provides access to non-code resources.
4. Notification Manager – provides notifications and alerts in the status bar.
5. Activity Manager – manages the lifecycle of applications such ad multi-tasking.

2.2.3 Android Libraries

Android system uses a set of C/C++ libraries. These enable developers to indulge more on the Android application framework. Several core libraries are listed below: [1]

1. System C library – BSD-derived implementation of standard C system library or also known as libc, which is specifically tuned for embedded Linux devices.
2. Media Libraries – PacketVideo'OpenCore – based; which support playback and recording of many general audio and video formats such as MPEG4, H.264, MP3, AAC, AMR. It can also view static image files such as JPG and PNG.
3. Surface Manager – access to display subsystem of Android devices and composites 2D and 3D graphic layer perfectly from multiple applications.
4. LivWebCore – a web browser engine which powers the Android's browser and an embeddable web view.

5. SGL – 2D graphics engine
6. 3D libraries – and implementation based on OpenGL ES 1.0 APIs; which use either hardware 3D acceleration if the devices is available or the included highly optimized 3D software rasterizer.
7. FreeType – vector font and bitmap rendering
8. SQLite – a relational database engine available to all applications.

2.3 IP camera

IP camera or also known as Internet Protocol camera is a digital video camera which is commonly used for surveillance. The camera send and receive data via network unlike a closed circuit television (CCTV) camera that transfer data via cables. This is different from webcam which use the USB connection to the computer which restrains in terms of placement for surveillance purposes. There are wired and wireless IP cameras, both with the same functionality but the wireless win in terms of portability to place the cameras in strategic locations. [2]

There are two types of IP cameras: [2]

1. Centralized IP cameras – which require a central Network Video Recorder to handle recording, video and alarm management.
2. Decentralized IP cameras – doesn't require a central Network Video Recorder.

2.3.1 IP camera HTTP command

The IP camera uses several network protocols in order to send or receive data. Each IP camera is assigned with its own IP address. A certain HTTP command for the IP camera is needed to send or receive a specific data. [3]

Sample command:

Get brand Info

Example:

http://<servername>/cgi-bin/view/param?action=list&group=General.Brand

Return:

root.General.Brand.Brand=XXXX
root.General.Brand.ProdFullName=XXXX CMOS Network Camera
root.General.Brand.ProdNbr=F12345
root.General.Brand.ProdShortName=F12345 CMOS Network Camera
root.General.Brand.ProdType=Network Camera
root.General.Brand.WebURL=www.xxxxx.com

2.4 DDNS

DDNS or dynamic DNS is a network service that provides a network device such as a router which is using the Internet Protocol Suite to notify a previously assigned Host name to change in real time the current IP of the router. [4]

This service is used for a network which is dynamic IP is assigned . Only by connecting to the Host name specified, the user can connect to the current IP of the network. One of the companies provides this service is Dyndns.com by Dynamic Network Services Inc. [5]

2.5 GlassFish

The server used in this project is GlassFish. It is an open source development to build a Java application server. By using GlassFish, user will able to develop a high quality server with new features that available faster. It is also designed to encouraged developers to participate more in the application server development process. [6]

The reason GlassFish is favored by most is because it is an Open Source, Community Based implementation of Java EE5 where it is a huge improvement over earlier version. The server produced has a very good performance quality. The administrative console and security support is also in production quality. The web services stack of GlassFish is currently good and is improving more and more. It supports AJAX and scripting. [6]

2.6 Java

Java is one of the programming languages in developing software. It was first released by Sun Microsystems in 1995. Currently most of the utilities, games and business application were powered by Java. It doesn't only run on the computer, but handheld devices such as mobile phone and tablets application is also powered by Java. [7]

CHAPTER 3

METHODOLOGY

3.1 Introduction

For the project, Windows 7 is used as the operating system for the server. The web application server (JSP) is built using Netbeans IDE 6.9.1,where Eclipse Classic with Android ADB is used to build the application client. The camera used is TP-Link SC3130G and the Android device used as the client is HTC Legend.

3.1.1 Conceptual Architecture

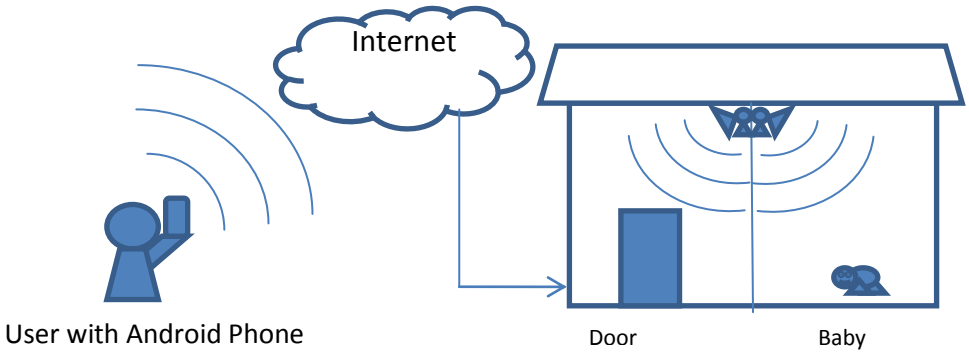

Figure 3.1.1.1: Conceptual Architecture

3.1.2 System Architecture

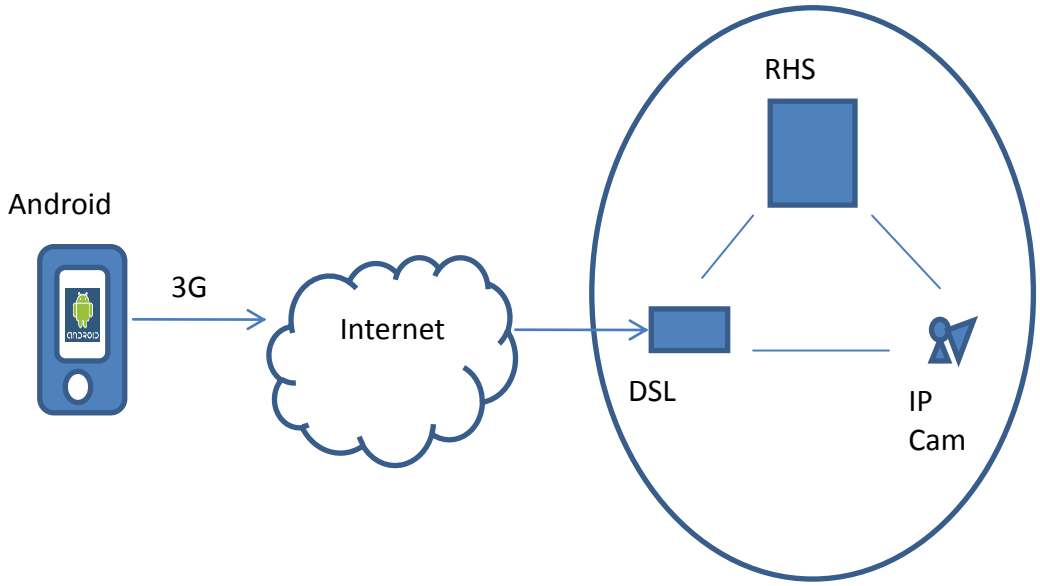

Figure 3.1.2.1: System Architecture

3.1.3 Software Architecture

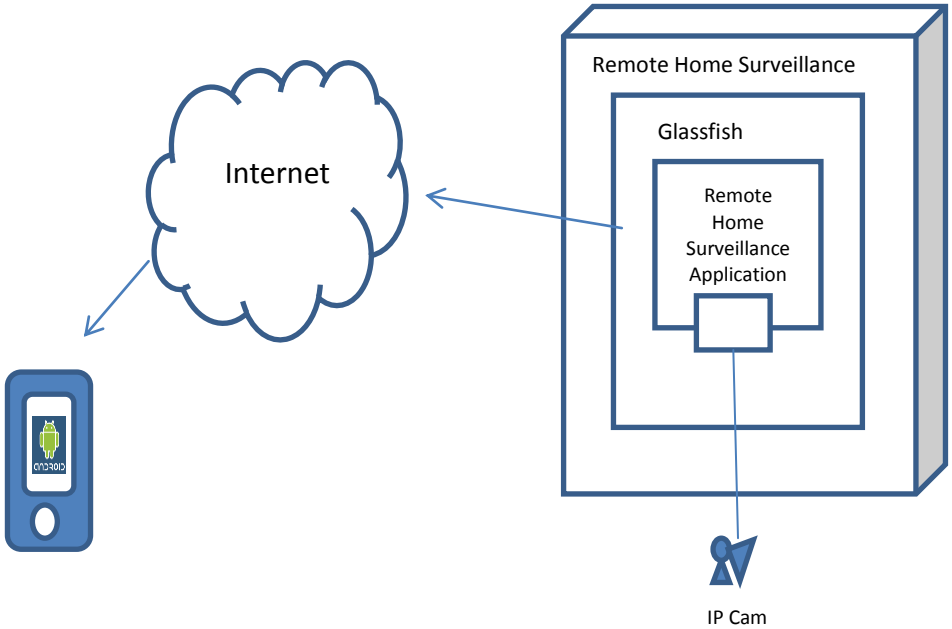

Figure 3.1.3.1: Software Architecture

3.2 NetBeans

The latest version of NetBeans could be downloaded from http://netbeans.org/downloads/. For this project, NetBeans IDE 6.9.1 was used.

JAVA SDK is needed to be installed in the computer. It can be obtained from http://www.oracle.com/technetwork/java/javase/downloads/index.html. It is needed for JAVA programming.

3.2.1 Java Web Application (JSF) using NetBeans

Firstly, a new JAVA web application project is created. From there, a JSP file is created that act as the interface for the application. For the login page, two classes are needed. One is the login action form, this is the form that will pass the value input from the user, and pass it to the other class, which is the login action class. This class will check the relevant of the credential input from the user and direct the user to other page.

The login action form class:

```
public ActionErrors validate(ActionMapping mapping,
HttpServletRequest request) {
        ActionErrors errors = new ActionErrors();
        if (getUsername() == null || getPassword().length() < 1) {
           errors.add("name", new
ActionMessage("error.name.required"));
           // TODO: add 'error.name.required' key to your resources
        }
        return errors;
```

The login action form class will get the username and password and pass it to login action class.

Login Action Class

```
public ActionForward execute(ActionMapping mapping,
ActionForm form,
    HttpServletRequest request, HttpServletResponse response)
    throws Exception {

    LoginActionForm loginActionForm = (LoginActionForm)
form;

    System.out.print(loginActionForm.getUsername());
    System.out.print(loginActionForm.getPassword());

    if (loginActionForm.getUsername().equals("test") &&
loginActionForm.getPassword().equals("test") ) {
      return mapping.findForward(SUCCESS);
    } else {
      return mapping.findForward(FAIL);
    }
```

After the class is created the User Interface for the login page can then be created using JSP.

JSP for Login Page:

```
<body>
    <h1>Remote Home Surveillance</h1>
    <br/>
    <html:errors/>
```

```
<html:form action="/login">
  Username:<html:text property="username"/>
  <br>
  Password:<html:password property="password"/>
  <br>
  <html:submit value="Login"/>
</html:form>
</body>
```

After the login page is created, the home page for the application is built. The interface for the home page uses jQuery Mobile framework. It is a template framework which is suitable for mobile applications to improve the UI with its touch-optimized layouts and UI widgets.

To use the framework, a certain libraries must first be added:

```
<link rel="stylesheet" href="http://code.jquery.com/mobile/1.0a2/jquery.mobile-1.0a2.min.css" />

    <script type="text/javascript" src="http://code.jquery.com/jquery-1.4.3.min.js"></script>

    <script type="text/javascript" src="http://code.jquery.com/mobile/1.0a2/jquery.mobile-1.0a2.min.js">
```

Then the UI can be fully manipulated by adding the links to complete the home page:

```
<a href="./main.jsp" rel="external" data-icon="delete">signout</a>
                    <h1>RHS</h1>
                </div><!-- /header -->

                <ul data-role="listview" data-inset="true" data-theme="c"
data-dividertheme="b">
                    <li data-role="list-divider">Camera</li>
                    <li><a href="./liveView.jsp" rel="external">Live
View</a></li>
                </ul>
```

For the Live View function, a new JSP page is created. This is for the interface and the viewing of the image for the IP camera. The command for retrieving the image from the camera was used which is:

http://<IpAdress>/jpg/image.jpg

To view the image continuously in a stream the image is refreshed every 1.5 second using java script:

```
<script language=javascript>
    var refreshrate=2;
    var image="http://<IPaddress>/jpg/image.jpg";
```

```
var imgwidth=300;

var imgheight=290;

function refresh(){document.images["pic"].src=image+"?"+new
Date();setTimeout('refresh()', refreshrate*1250);}

document.write('<img src="'+image+'"
height="'+imgheight+'"width="'+imgwidth+'" name="pic">');

if(document.images) window.onload=refresh;

</script>
```

The page will then allow the user to view the image in a continuous motion.

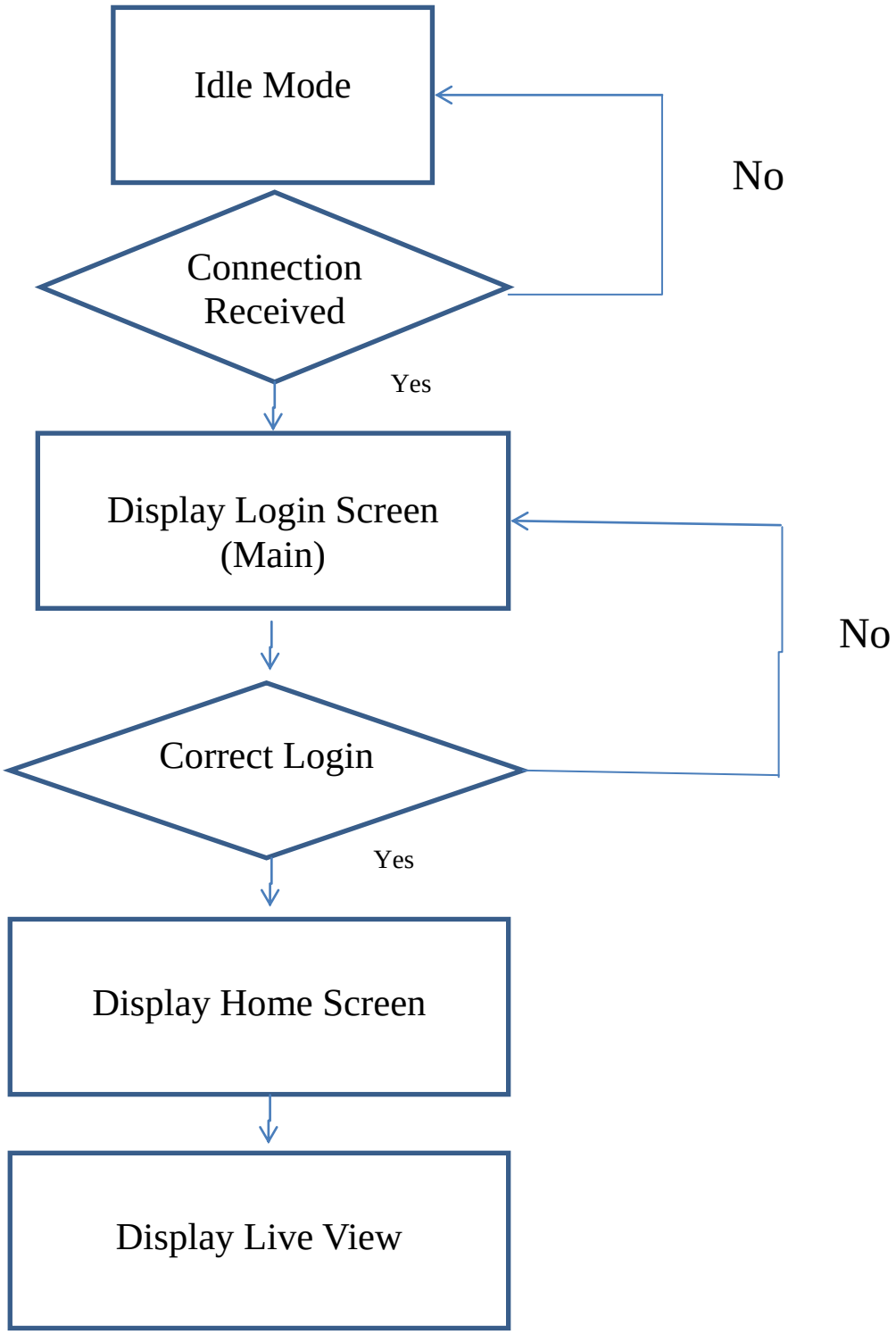

Figure 3.2.2.1: Server Flowchart

3.3 Eclipse

The latest version of Eclipse could be downloaded from http://www.eclipse.org/downloads/. For this project, Eclipse Classic was used. Android SDK is needed to be installed in the computer. It can be obtained from http://developer.android.com/sdk/. It is needed for Android programming.

3.3.1 Android Programming using Eclipse

Since the Java Web Application Server (JSF) was created by using NetBeans IDE, to create the Android application, Eclipse is used. The Web application is encapsulated into an Android application using the code:

```
WebView mWebView;

    /** Called when the activity is first created. */
    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);

        mWebView = (WebView) findViewById(R.id.webview);
        mWebView.getSettings().setJavaScriptEnabled(true);
        mWebView.loadUrl("http://<IP>/rhsfb/");
        mWebView.setWebViewClient(new RHSFBWebViewClient());
    }
```

The project is then exported into APK to be installed using any Android Phone.

3.4 Server – Router Port-forwarding

The server will be located at home connected through a router. In order for the server to be connected from outside address, the router must first be set up to be able to port forwarded to the IP of the server in the enclosed network. This can be done by opening the router settings and add the IP of the server along with a certain port number. A user outside of the Local Area Network can then reach the server by:

http:// <IP address given by ISP to the router>:<the port number assign to the server>

However, the IP address given by the ISP is dynamic, it will keep on changing.

3.5 Using DDNS for Dynamic IP

Because of the ever-changing IP address given by the ISP, it will cause problem on the client to connect to the server and the IP camera which are both connected through a router. The solution is by using DDNS. Some of the company which provides the service of DDNS is Dyndns.org.

To assign a DDNS, firstly register a hostname with Dyndns.org, a username and a password are required. After the registration is completed, the hostname will automatically assigned to your current IP. To resolve the problem of the ever-changing IP address given by the ISP. The host name, username and password can be inserted to the router settings so that whenever the router is restarted (change IP), the router will inform dyndns.org the current IP. But by only using the host name registered, the current IP can be obtained.

CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

The image from the IP camera is obtained by requesting the image itself. This is done by the server to connect to the IP camera through TCP/IP. The user/client will then connect to the server using the Android Phone to gain access to the camera and enable the features of viewing their home remotely through TCP/IP.

4.2 Display

4.2.1 Main Client Interface (Login)

Figure 4.2.1.1: Main Client Interface (Login)

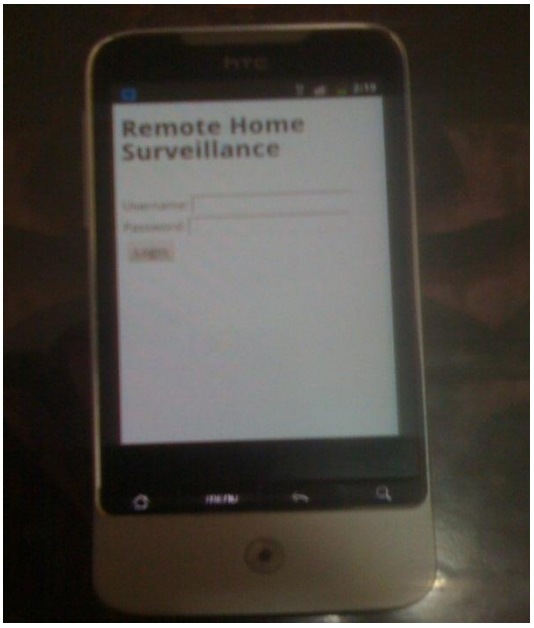

Figure 4.2.1.2: Main Client Interface (Login) Mobile

When the Android application is opened, the client will connect to the server, if the connection is successful, the user will be shown a login screen. The user must then input the correct credential for the login. Only then the user will be forwarded to the home screen.

4.2.2 Home Screen

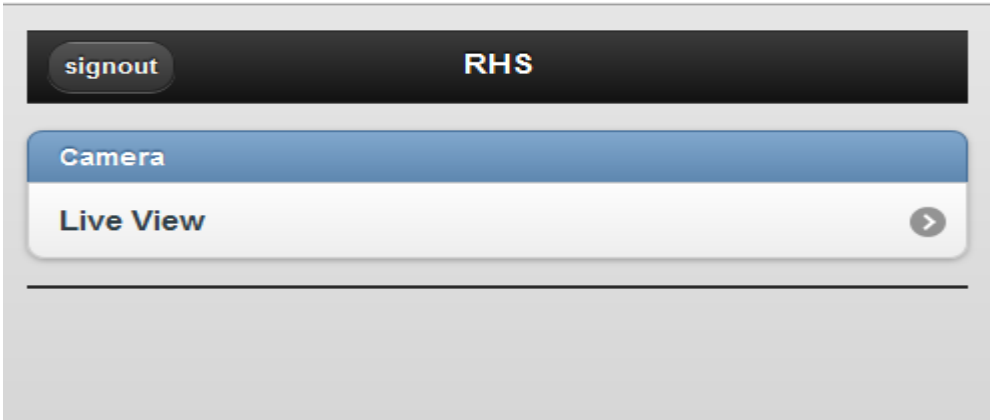

Figure 4.2.2.1: Home Screen

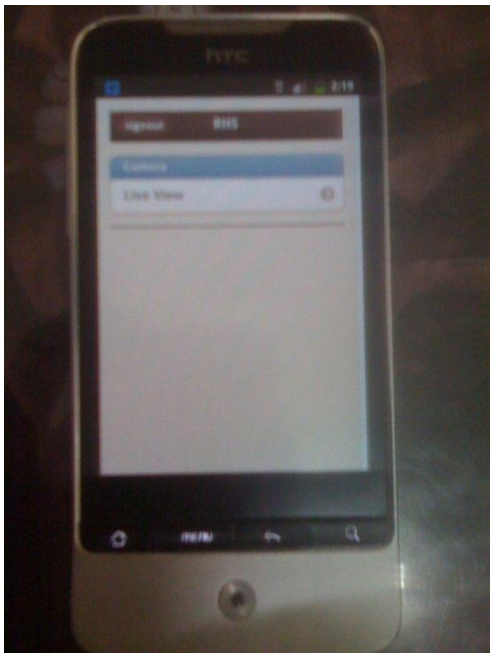

Figure 4.2.2.2: Home Screen Mobile

If the user entered the correct username and password from the login screen, the user will then be shown the home screen. From the home screen, the user can then choose to sign out which will be brought to the login screen, or to use the live view features. If the user chose live view, they will then brought to the live view page.

4.2.3 Live View

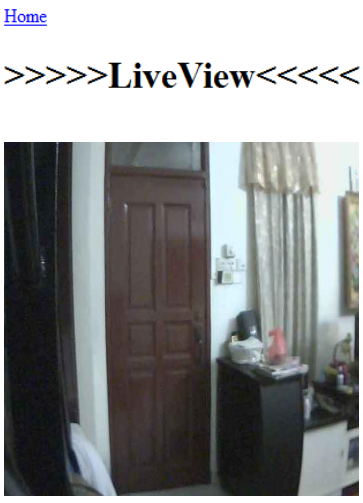

Figure 4.2.3.1: Live View

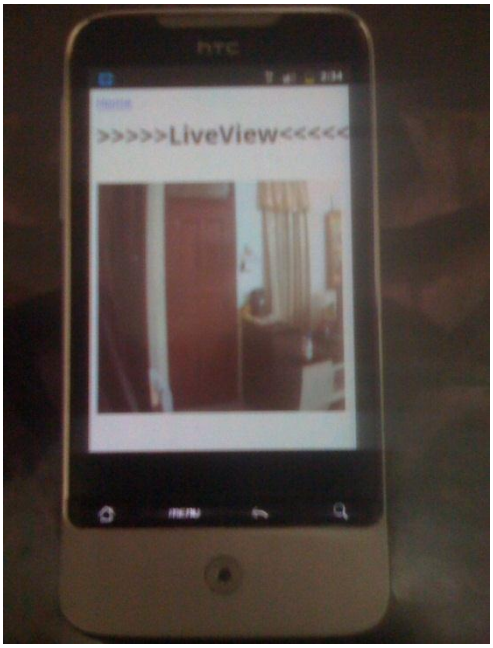

Figure 4.2.3.2: Live View Mobile

In this mode, the user can live view their home. The image interval is 1.5s between previous image and the next one. The user can then press the Home button on the Android phone to let the application run in the background so they can multitask with other things, and they can quickly switch to this application for quick viewing. The user can then click ‘Home’ to return to the home screen.

4.3 Image Captures

The image interval between each picture is 1.5 seconds, this is the minimal preferences for smooth viewing for a client that is outside of the Local Area Network from the router and IP camera.

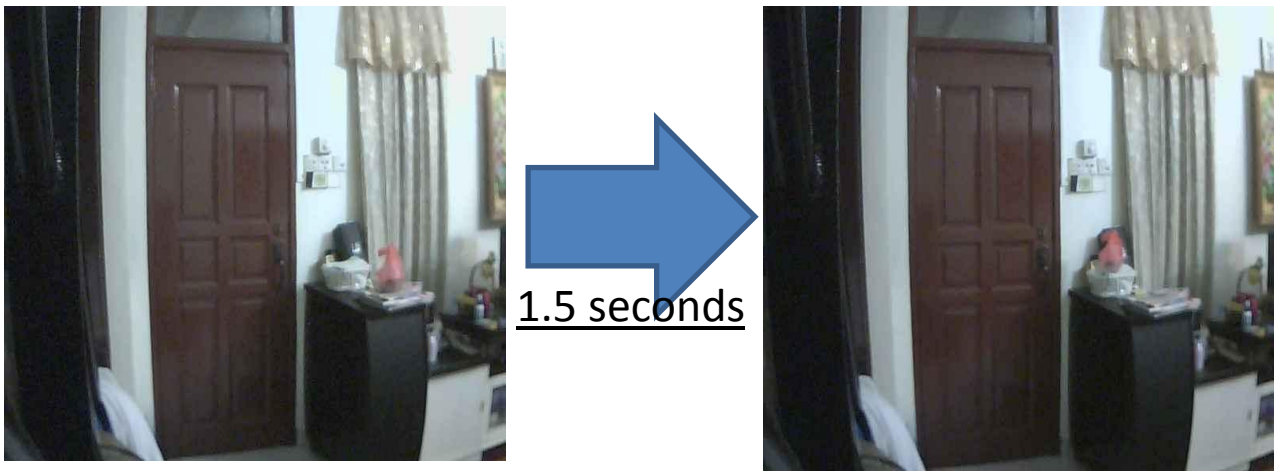

Figure 4.3.1: Image Interval

4.4 Target Deployment

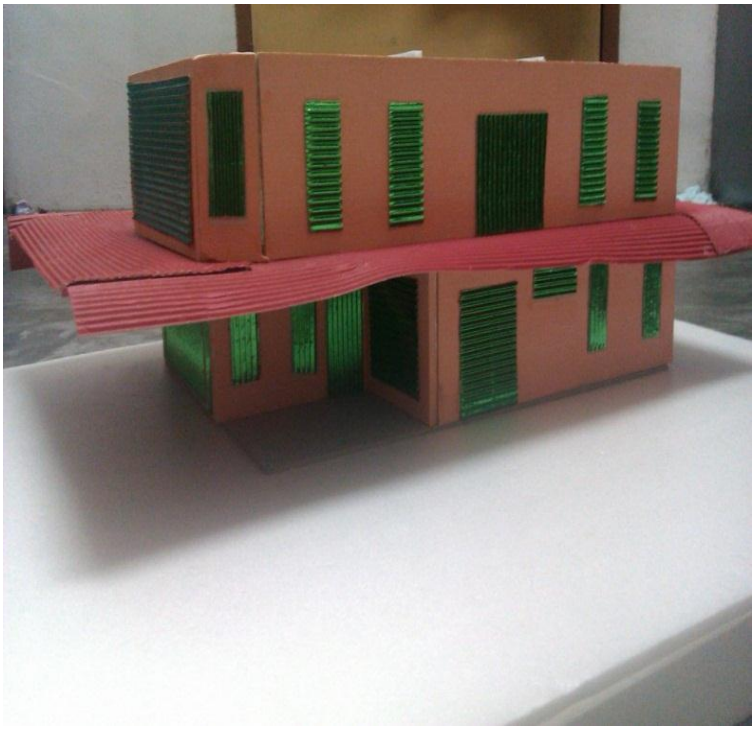

Figure 4.4.1: House Overview

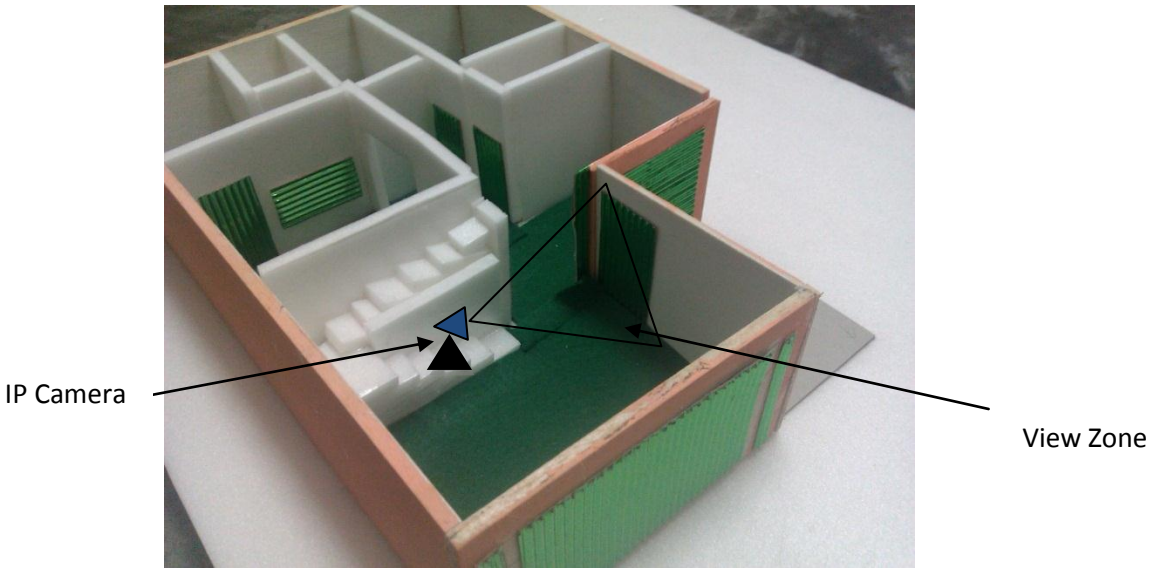

Figure 4.4.2: House (Indoor)

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The ability to view our home remotely is essential to keep our home save from any unwanted activities such as burglary or other emergency situations. To view remotely a handheld device is needed such as an Android –platform phone. With the help of this program, the user can prevent any accidents, misfits, injury and many other things from occurring. The safety of our home and loved ones should be a number one priority.

The goal of this project is to create a home surveillance program for the open source system which is Android phone. The feature included is to view homes remotely using Android phone through TCP/IP. As the conclusion, the objectives of this project are successfully achieved.

5.2 Problems

Although the objectives of the project is met, there are several limitations on this project that would waste battery power of the phone or would make the live view unusable and those limitations are described as follows:

1. Sometimes the client haves problem locating the Dynamic IP for the server. This is because of the ever-changing IP address given by the Internet Service Provider (ISP) which needed to restart the router if this problem occurs.
2. The need to connect to the internet remotely while live-viewing and multi-tasking may consume the phone battery.
3. There are several locations where we can't get access to the internet (WIFI,3G,GPRS), hence the phone can't connect to the server.
4. If the electricity or the internet connection at home (server) is down, the client can't connect to the server. However, if the internet connection is down, the system can still be used locally.

5.3 Recommendation

There are several recommendations I would like to propose, and they are:

1. A motion detection features should be added to notify the user in case of a motion is triggered, so the user doesn't need to turn the applications all the time to view.
2. Include a timer to save the image to the database so the user can view a snapshot of the image from previous time.
3. Use a server with low running power on idle mode such as Mac from Apple. So the server can be on 24 hours with low energy consumptions.

4. Include a home automation service in the application which can control the appliance in the house, where in this case the light from the room where the IP camera is pointing, so when the room is at night and dark, the user can switch on the light for brighter view.

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APPENDIX A

Project 1 Gantt Chart

SEMESTER 1:

ACTIVITY/WEEK	2	3	4	5	6	7	8	9	10	11	12	13	14
Literature Study													
Product Searching													
Product and algorithm finalization													
Understanding the components protocol													
Report Writing													

APPENDIX B

Project 2 Gantt Chart

SEMESTER 2:

ACTIVITY/WEEK	2	3	4	5	6	7	8	9	10	11	12	13	14
Design a Web Service Server													
Design a Surveillance Manager													
Design Phone app													
Integrate Camera, Server , Phone													
Conduct test case													
Debug and Modification													
Thesis Writing													

APPENDIX C

JSF Code

Login Action Form Class

```
package my.utm.fke.rhs.loginactionform;
import javax.servlet.http.HttpServletRequest;
import org.apache.struts.action.ActionErrors;
import org.apache.struts.action.ActionMapping;
import org.apache.struts.action.ActionMessage;
public class LoginActionForm extends org.apache.struts.action.ActionForm {
    private String username;
   private String password;
      public LoginActionForm() {
       super();
   }
    public ActionErrors validate(ActionMapping mapping, HttpServletRequest request) {
       ActionErrors errors = new ActionErrors();
       if (getUsername() == null || getPassword().length() < 1) {
          errors.add("name", new ActionMessage("error.name.required"));
             }
       return errors;
   }
      public String getUsername() {
       return username;
   }
    public void setUsername(String username) {
       this.username = username;
   }
     public String getPassword() {
       return password;
   }
    public void setPassword(String password) {
       this.password = password;
   }
}
```

This is the source code for the Login Action Form Class which passes the value of username and password to Login Action Class.

Login Action Class

```
package my.utm.fke.rhs.loginaction;

import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import my.utm.fke.rhs.loginactionform.LoginActionForm;
import org.apache.struts.action.ActionForm;
import org.apache.struts.action.ActionForward;
import org.apache.struts.action.ActionMapping;

public class LoginAction extends org.apache.struts.action.Action {

    private static final String SUCCESS = "success";
   private static final String FAIL = "fail";

   @Override
   public ActionForward execute(ActionMapping mapping, ActionForm form,
         HttpServletRequest request, HttpServletResponse response)
         throws Exception {

      LoginActionForm loginActionForm = (LoginActionForm) form;

      System.out.print(loginActionForm.getUsername());
      System.out.print(loginActionForm.getPassword());

      if (loginActionForm.getUsername().equals("test") && loginActionForm.getPassword().equals("test") ) {
         return mapping.findForward(SUCCESS);
      } else {
         return mapping.findForward(FAIL);
      }
   }
}
```

This is the source code for the Login Action Class which receives the values from Login Action Form class and verifies it and then does the action needed.

Login JSP

```
<%@ taglib uri="http://struts.apache.org/tags-html" prefix="html" %>
<%@page contentType="text/html" pageEncoding="UTF-8"%>

<html>
   <head>
      <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
      <title>RHS</title>
   </head>
   <body>
      <h1>Remote Home Surveillance</h1>
      <br/>
      <html:errors/>
      <html:form action="/login">
         Username:<html:text property="username"/>
         <br>
         Password:<html:password property="password"/>
         <br>
         <html:submit value="Login"/>

      </html:form>

   </body>
</html>
```

This is the code for the Login Page is JSP. The page creates an interface with a form which prompt user to input the username and password.

Home JSP

```
<%@ taglib uri="http://struts.apache.org/tags-html" prefix="html" %>
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<html>
  <head>
    <title>RHS</title>
    <link rel="stylesheet" href="http://code.jquery.com/mobile/1.0a2/jquery.mobile-1.0a2.min.css" />
    <script type="text/javascript" src="http://code.jquery.com/jquery-1.4.3.min.js"></script>
    <script type="text/javascript" src="http://code.jquery.com/mobile/1.0a2/jquery.mobile-
1.0a2.min.js"></script>
  </head>
  <body>
    <div data-role="header" data-position="inline">
      <div data-role="page" data-theme="b" id="jqm-home">
        <div data-role="content">
          <div data-role="header">
            <a href="./main.jsp" rel="external" data-icon="delete">signout</a>
            <h1>RHS</h1>
          </div><!-- /header -->
           <ul data-role="listview" data-inset="true" data-theme="c" data-dividertheme="b">
            <li data-role="list-divider">Camera</li>
            <li><a href="./liveView.jsp" rel="external">Live View</a></li>
           </ul>
          <div data-role="footer">
            <div data-role="navbar">
              <ul>
              </ul>
            </div><!-- /navbar -->
          </div><!-- /footer -->
      </body>
</html>
```

This is the source code for the home page which is using jQuery Mobile Framework. From this page, user can go to the Live View page or sign out.

Live View JSP

```
<%@ taglib uri="http://struts.apache.org/tags-html" prefix="html" %>
<%@page contentType="text/html" pageEncoding="UTF-8"%>
<html>
      <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
      <title>RHS</title>
   </head>
   <body>
      <div>
      <html:link action="/home">Home</html:link>
      <br/>
      <h1>>>>>>LiveView<<<<<<</h1>
      <br/>
      <div>
      <script language=javascript>
var refreshrate=2;
var image="http://<ip>/jpg/image.jpg";
var imgwidth=300;
var imgheight=290;
function refresh(){document.images["pic"].src=image+"?"+new Date();setTimeout('refresh()',
refreshrate*1250);}
document.write('<img src="'+image+'" height="'+imgheight+'"width="'+imgwidth+'"
name="pic">');
if(document.images) window.onload=refresh;

</script>
</div>
      </div>
</body>
    </body>
</html>
```

This is the source code for the live view page, where every 1.5 seconds, the image will refresh creating a continuous stream of image.

APPENDIX D

Android Programming

Android Application Creation

```
package com.utm.fke.rhsfbl;
import android.app.Activity;
import android.os.Bundle;
import android.view.KeyEvent;
import android.webkit.WebView;
import android.webkit.WebViewClient;
public class RHSFBL extends Activity {
        @Override
        public boolean onKeyDown(int keyCode, KeyEvent event) {
           if ((keyCode == KeyEvent.KEYCODE_BACK) && mWebView.canGoBack()) {
              mWebView.goBack();
              return true;
           }
           return super.onKeyDown(keyCode, event);
        }
        private class RHSFBWebViewClient extends WebViewClient {
           @Override
           public boolean shouldOverrideUrlLoading(WebView view, String url) {
              view.loadUrl(url);
              return true;
           }
        }
        WebView mWebView;
   @Override
   public void onCreate(Bundle savedInstanceState) {
      super.onCreate(savedInstanceState);
      setContentView(R.layout.main);
      mWebView = (WebView) findViewById(R.id.webview);
      mWebView.getSettings().setJavaScriptEnabled(true);
      mWebView.loadUrl("http://192.168.43.227:8080/rhsfb/");
      mWebView.setWebViewClient(new RHSFBWebViewClient());
   }
}
```

This is the code for Eclipse to encapsulate the web server in an android application.

APPENDIX E

SAMPLE IP CAMERA COMMAND

SAMPLE IP CAMERA COMMAND

System Category

Get brand Info

Example:

http://<servername>/cgi-bin/view/param?action=list&group=General.Brand

Return:

root.General.Brand.Brand=XXXX

root.General.Brand.ProdFullName=XXXX CMOS Network Camera

root.General.Brand.ProdNbr=F12345

root.General.Brand.ProdShortName=F12345 CMOS Network Camera

root.General.Brand.ProdType=Network Camera

root.General.Brand.WebURL=www.xxxxx.com

Get/Set account Info

Example: Get account information

http://<servername>/cgi-bin/view/param?action=list&group=General.UserID

Return:

root.General.UserID.ViewerAuthen=on

root.General.UserID.ViewerModeDefault=000007ff

root.General.UserID.Admin=YWRtaW46YWRtaW4=

root.General.UserID.User1=MTExMToxMTEx,0000003f

root.General.UserID.User2=MjIyMjoyMjIy,0000063f

root.General.UserID.User3=MzMzMzozMzMz,000007ff

root.General.UserID.User4=Og==,000007ff

root.General.UserID.User5=Og==,000007ff

root.General.UserID.User6=Og==,000007ff

root.General.UserID.User7=Og==,000007ff

root.General.UserID.User8=Og==,000007ff

root.General.UserID.User9=Og==,000007ff

Example: Set account information

http://<servername>/cgi-bin/admin/param?action=update&General.UserID.ViewerAuthen=off&General.UserID.User1= MzMzMzozMzMz,000007ff

Return:

OK

Get Firmware info

Example:

http://<servername>/cgi-bin/view/param?action=list&group=Properties.Firmware

Return:

root.Properties.Firmware.BuildDate=Tue Mar 20 22:26:10 CST 2007

root.Properties.Firmware.Version=LM.0.3.14

Get hardware version

Example:

http://<servername>/cgi-bin/view/param?action=list&group=Properties.Hardware

Return:

4

root.Properties.Hardware.Version=00

Get/Set Network Interface info

Example: Get Network interface information

http://<servername>/cgi-bin/view/param?action=list&group=General.Network.eth0

Return:

root.General.Network.eth0.Broadcast=192.168.1.255

root.General.Network.eth0.DNSAuto=192.168.1.255

root.General.Network.eth0.DNSServer1=192.168.1.255

root.General.Network.eth0.DNSServer2=192.168.1.255

root.General.Network.eth0.BootProto=192.168.1.255

root.General.Network.eth0.IPAddress=192.168.1.255

root.General.Network.eth0.MACAddress=192.168.1.255

root.General.Network.eth0.SubnetMask=192.168.1.255

root.General.Network.eth0.DefaultRouter=192.168.1.255

root.General.Network.eth0.IPAddressRange=192.168.1.255

Example: Set Network interface information

http://<servername>/cgi-bin/admin/param?action=update&General.Network.eth0.BootProto=off&General.Network.eth0.IPAddress=192.168.1.99

Return:

OK

Get/Set UPNP info

Example: Get UPnP information

http://<servername>/cgi-bin/view/param?action=list&group=General.Network.UPnP

Return:

root.General.Network.UPnP.Enabled=yes

root.General.Network.UPnP.NATTraversal.Enabled=no

root.General.Network.UPnP.NATTraversal.HTTPPort=80

root.General.Network.UPnP.NATTraversal.HTTPSPort=443

root.General.Network.UPnP.NATTraversal.HTTPViewerPort=8090

root.General.Network.UPnP.NATTraversal.HTTPViewerPortSSL=8091

root.General.Network.UPnP.NATTraversal.HTTPViewerPort2=8070

root.General.Network.UPnP.NATTraversal.HTTPViewerPort2SSL=8071

root.General.Network.UPnP.NATTraversal.HTTPViewerPort3=8050

root.General.Network.UPnP.NATTraversal.HTTPViewerPort4=8030

Example: Set UPnP information

http://<servername>/cgi-bin/admin/param?action=update&General.Network.UPnP.Enabled=yes&General.Network.UPnP.NATTraversal.Enabled=no

Return:

OK

Get/Set PPPoE info

Example: Get PPPoE information

http://<servername>/cgi-bin/view/param?action=list&group=General.Network.PPPoE

Return:

root.General.Network.PPPoE.Enabled=no
root.General.Network.PPPoE.IPAddress =67.34.251.69
root.General.Network.PPPoE.UserID=none
root.General.Network.PPPoE.Password=none
root.General.Network.PPPoE.DNSAuto=on
root.General.Network.PPPoE.DNSServer1=0.0.0.0
root.General.Network.PPPoE.DNSServer2=0.0.0.0

Example: Set PPPoE information

http://<servername>/cgi-bin/admin/param?action=update&General.Network.PPPoE.Enabled=yes&General.Network.PPPoE.UserID=example@hinet.net&General.Network.PPPoE.Password=12345678&
General.Network.PPPoE.DNSAuto=on

Return:

OK

Get/Set DDNS info

Example: Get DDNS information

http://<servername>/cgi-bin/view/param?action=list&group=General.Network.DDNS

Return:

root.General.Network.DDNS.Enabled=no
root.General.Network.DDNS.DDNSServer=www.dyndns.org
root.General.Network.DDNS.UserName=none
root.General.Network.DDNS.Password=none
9
root.General.Network.DDNS.HostName=none

Example: Set DDNS information

http://<servername>/cgi-bin/admin/param?action=update&General.Network.DDNS.Enable=yes&General.Network.DDNS.DDNSServer=www.dyndns.org&General.Network.DDNS.UserName=example&G
eneral.Network.DDNS.Password=12345678&General.Network.DDNS.HostName=www.example.dyn
dns.org

Return:

OK

Get/Set Time info

Example: Get Time information

http://<servername>/cgi-bin/view/param?action=list&group=General.Time

Return:

root.General.Time.ServerDate=1970-01-01

root.General.Time.ServerTime=02:30:14

root.General.Time.DateFormat=ymd

root.General.Time.SyncSource=NTP

root.General.Time.TimeZone=GMT 08:00/Asia/Taipei

1

root.General.Time.UTCOffset=00:00:00

Example: Set Time information

http://<servername>/cgi-bin/admin/param?action=update&General.Time.ObtainFromDHCP=no&General.Time.ServerDate=2007-09-18&General.Time.ServerTime=18:20:24&General.Time.DateFormat=ymd&General.Time.SyncSource=NTP&General.Time.TimeZone=GMT 08:00/Asia/Taipei&General.Time.UTCOffset=00:00:00

Return:

OK

Example: Set MJPEG video frame rate

http://<servername>/cgi-bin/admin/param?action=update&Image.I0.MJPEG.FPS=25

Return:

OK

Get JPEG still image

2

Example:

http://<servername>/ jpg/image

Return:

Ok

http://<servername>/ jpg/image.jpg

Return:

HTTP/1.0 200 OK\r\n

Content-Type: image/jpeg\r\n

Content-Length: <image size>\r\n

\r\n

<JPEG image data>\r\n

APPENDIX F

User Manual

USER MANUAL

1.1 Introduction

This user manual is intended to be used by the user to setup the physical network connection, configure the machines, and run the system. This user manual is divided into three sections;

1. Pre-installation
2. Configuration
3. Running the system

1.2 System Requirements

Server

A PC running on Windows, preferably Windows 7 with NetBeans installed.

Client

An Android phone running on firmware 2.2 and above with Internet Connection (non – local).

1.2.1 Camera

Requirement

i. TP-Link SC3130G IP camera or any TP-Link camera with same API.

1.2.2 Router

i. Router with port-forwarding features available.

ii. Router with DDNS available.

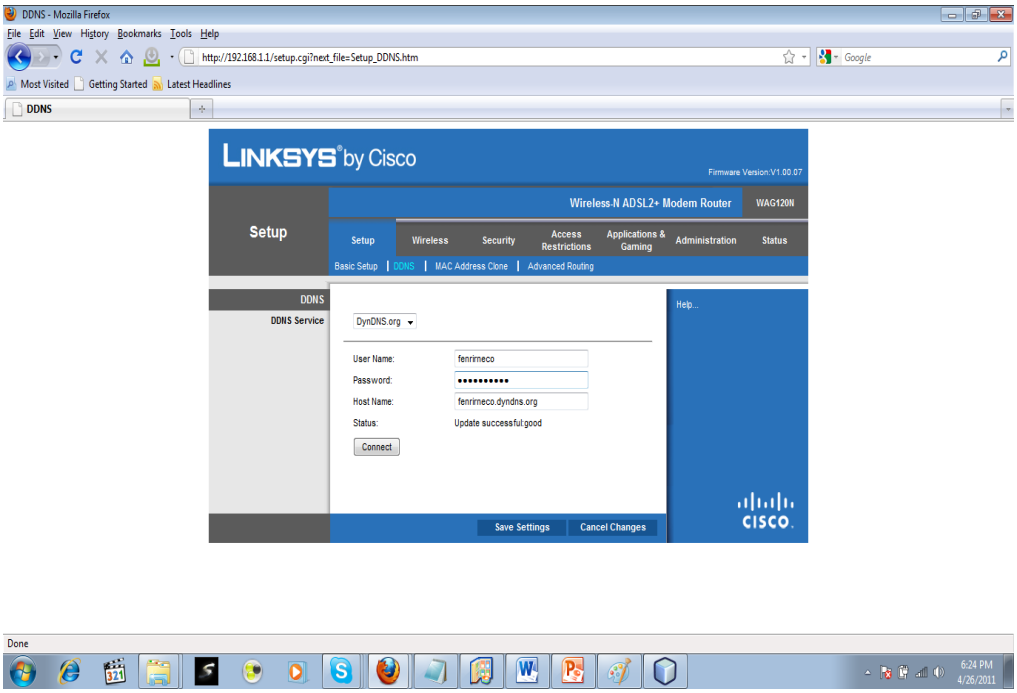
1.3 Pre-Installation

The pre-installation section refers to the setting up of the main components before they are joined together.

1.3.1 Preparing the DDNS

Visit dyndns.org, and register a host name. Jot down the username, hostname and password for the DDNS.

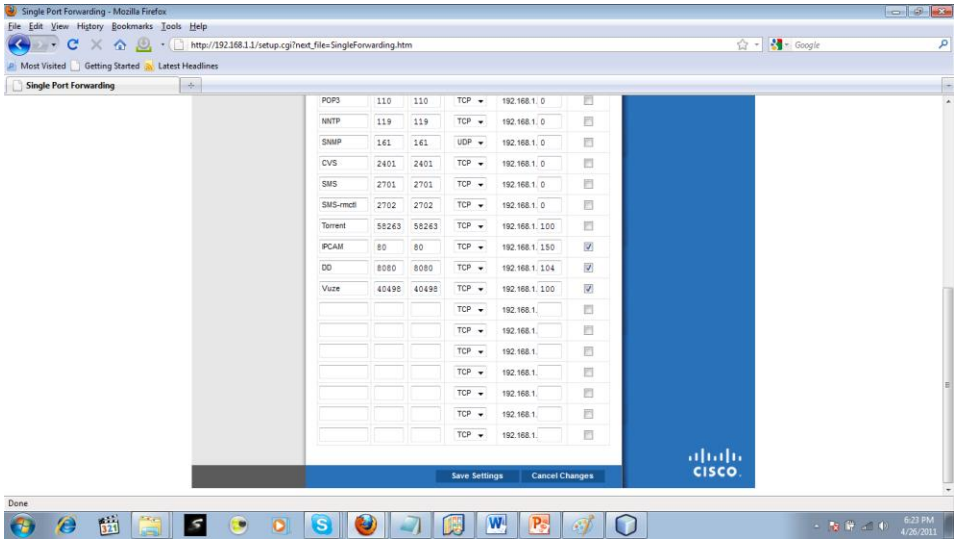
Open the router settings at home and input the username, hostname and password on the DDNS field.



After the username, password and hostname is input, save the settings.

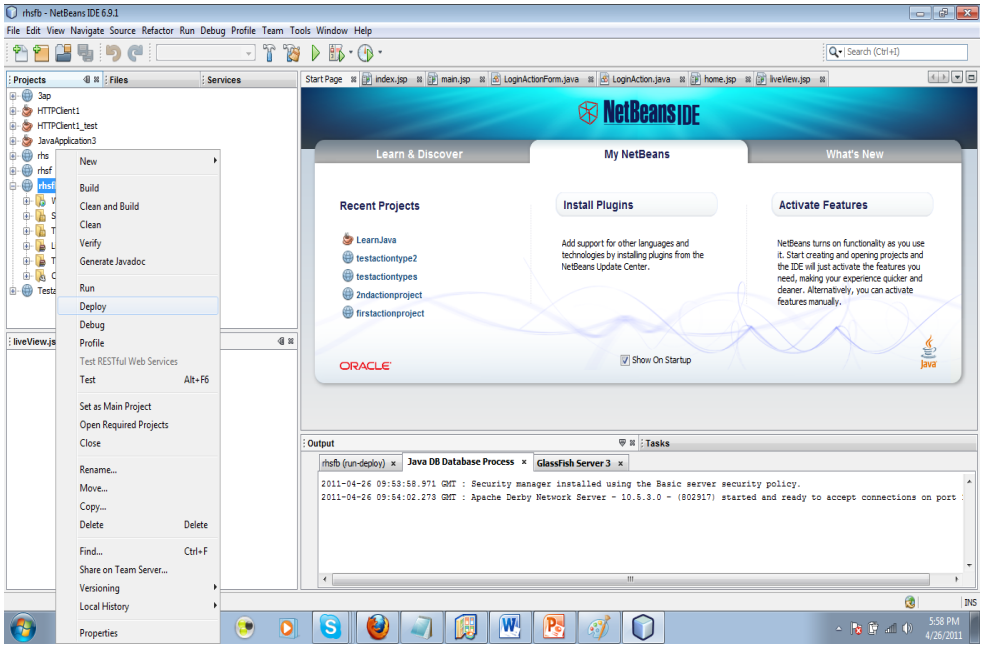
1.3.2 Port – forwarding

Open your router settings again and insert the static IP address of your current PC and the IP of your IP camera into the port forward.



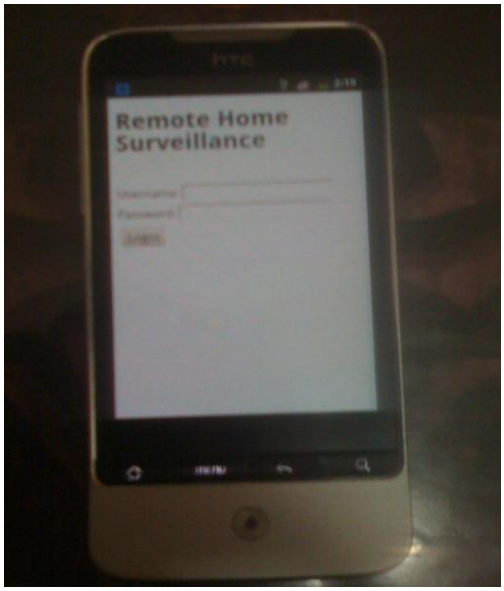
1.3.3 Deploy Server

Open netbeans and deploy the server. After that all is set. The application can be run using the Android phone.

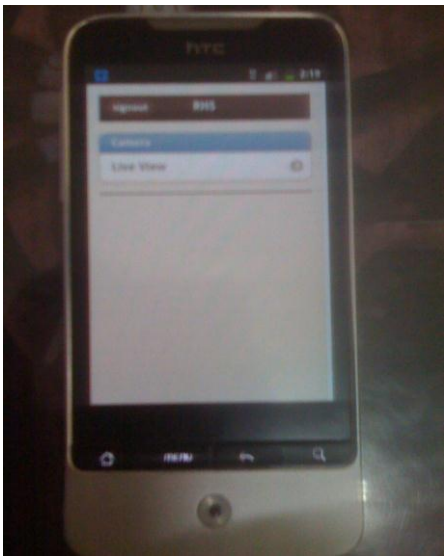


1.4 Running the System

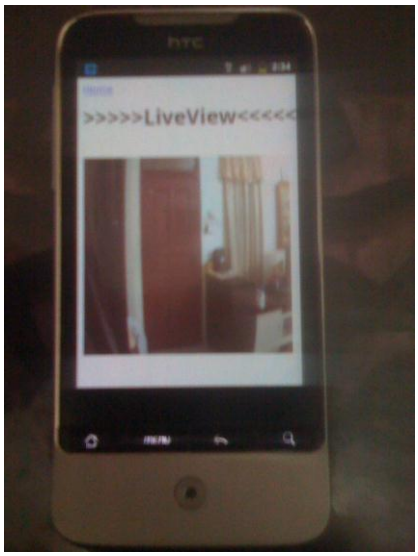
After all the main components have been setup and configured, using the Android Phone, open the application Remote Home Surveillance application.



Input the username and password for the system, after the correct credentials is inputted, you will be forwarded to the home screen.



In the home screen, just click the Live View to view remotely.



And that is all. The user can multitask, press home and sign out to close the application.

APPENDIX G

Video Demonstration

For the video demonstration of the application, the video file is available in the CD rom provided.

APPENDIX H

TECHNICAL REPORT

REMOTE HOME SURVEILLANCE USING ANDROID – PLATFORM PHONE THROUGH TCP / IP

Nowadays, our neighborhood isn't as safe as it was before. Crime and accidents happen almost all the time. The safety of our family and homes should be prioritized. One of the most reliable ways in protecting ourselves and our family is to equip our home with a surveillance system that will allow us to monitor the situation of certain key places. By equipping our home with a surveillance system we can prevent any burglary, accidents, injury that may happen which is very essential in making our home safe.

1.0 Android

Android is an open-source operating system for mobile phone which is developed by Google and is based upon Linux kernel and GNU software. Google provides developers an open development platform, which allows the developers the ability to create extremely rich and innovative applications. Developers are free to gain access to the device hardware, location information, run background services/multi-tasking, set alarms, adds notifications to the status bar and much more..

1.1 IP Camera

IP camera or also known as Internet Protocol camera is a digital video camera which is commonly used for surveillance. The camera send and receive data via network unlike a closed circuit television (CCTV) camera that transfer data via cables. This is different from webcam which use the USB connection to the computer which restrains in terms of placement for surveillance purposes. There are wired and wireless IP cameras, both with the same functionality but the wireless win in terms of portability to place the cameras in strategic locations.

1.2 DDNS

DDNS or dynamic DNS is a network service that provides a network device such as a router which is using the Internet Protocol Suite to notify a previously assigned Host name to change in real time the current IP of the router.

This service is used for a network which is dynamic IP is assigned . Only by connecting to the Host name specified, the user can connect to the current IP of the network. One of the companies provides this service is Dyndns.com by Dynamic Network Services Inc.

1.3 GlassFish

The reason GlassFish is favored by most is because it is an Open Source, Community Based implementation of Java EE5 where it is a huge improvement over earlier version. The server produced has a very good performance quality. The administrative console and security support is also in production quality. The web services stack of GlassFish is currently good and is improving more and more. It supports AJAX and scripting.

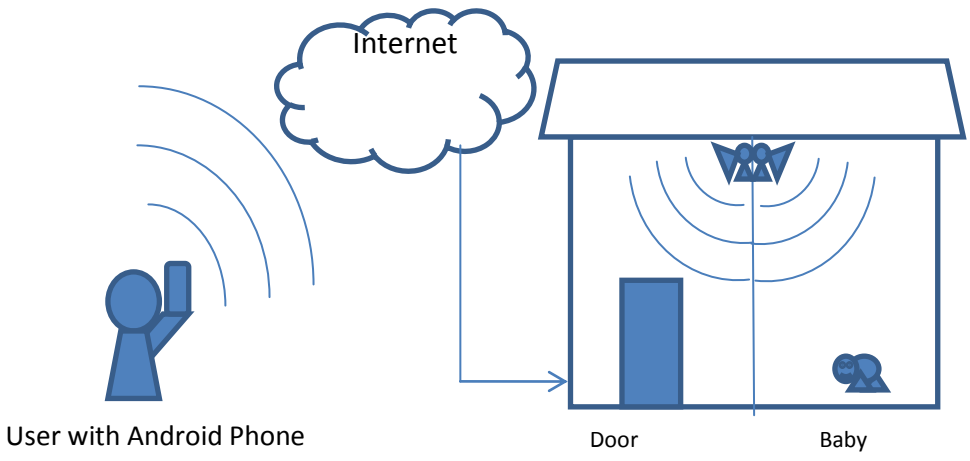


Figure 1.1: Conceptual Architecture

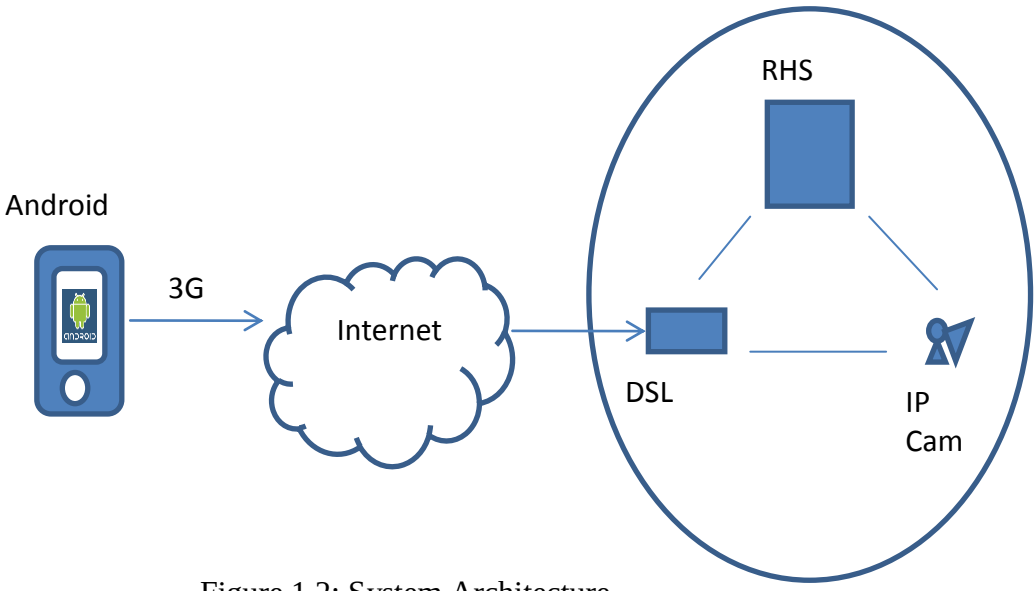


Figure 1.2: System Architecture

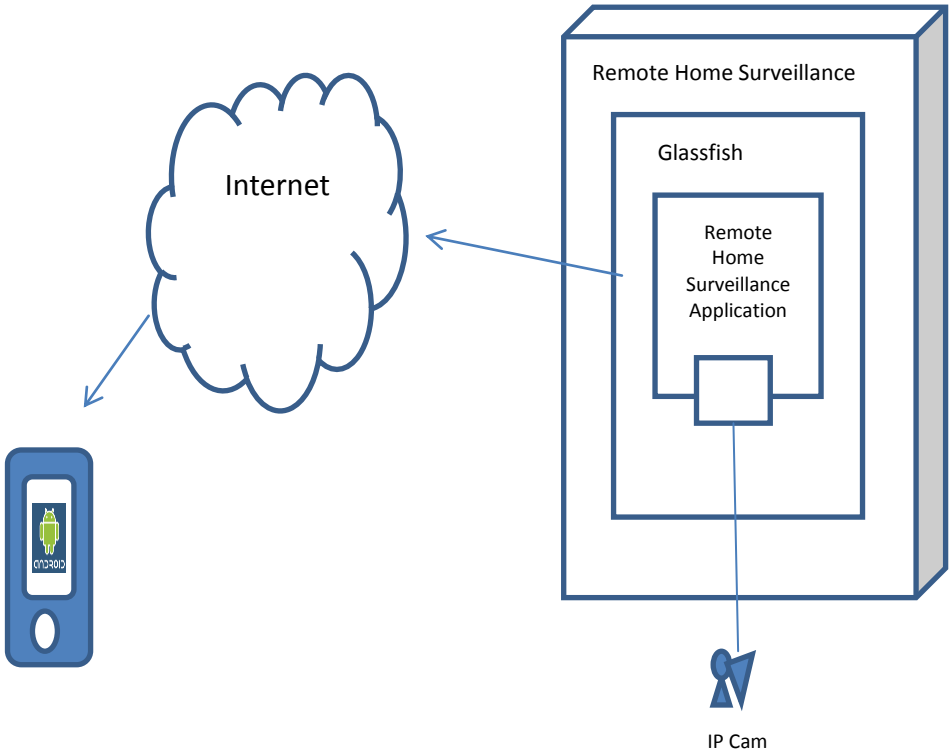


Figure 1.3: Software Architecture

1.4 Java Web Application (JSF) using NetBeans

A JSP file is created that act as the interface for the application. For the login page, two classes are needed. One is the login action form, this is the form that will pass the value input from the user, and pass it to the other class, which is the login action class. This class will check the relevant of the credential input from the user and direct the user to other page. The login action form class will get the username and password and pass it to login action class. After the class is created the User Interface for the login page can then be created using JSP. After the login page is created, the home page for the application is built. The interface for the home page uses jQuery Mobile framework. It is a template framework which is suitable for mobile applications to improve the UI with its touch-optimized layouts and UI widgets. For the Live View function, a new JSP page is created. This is for the interface and the viewing of the image for the IP camera.

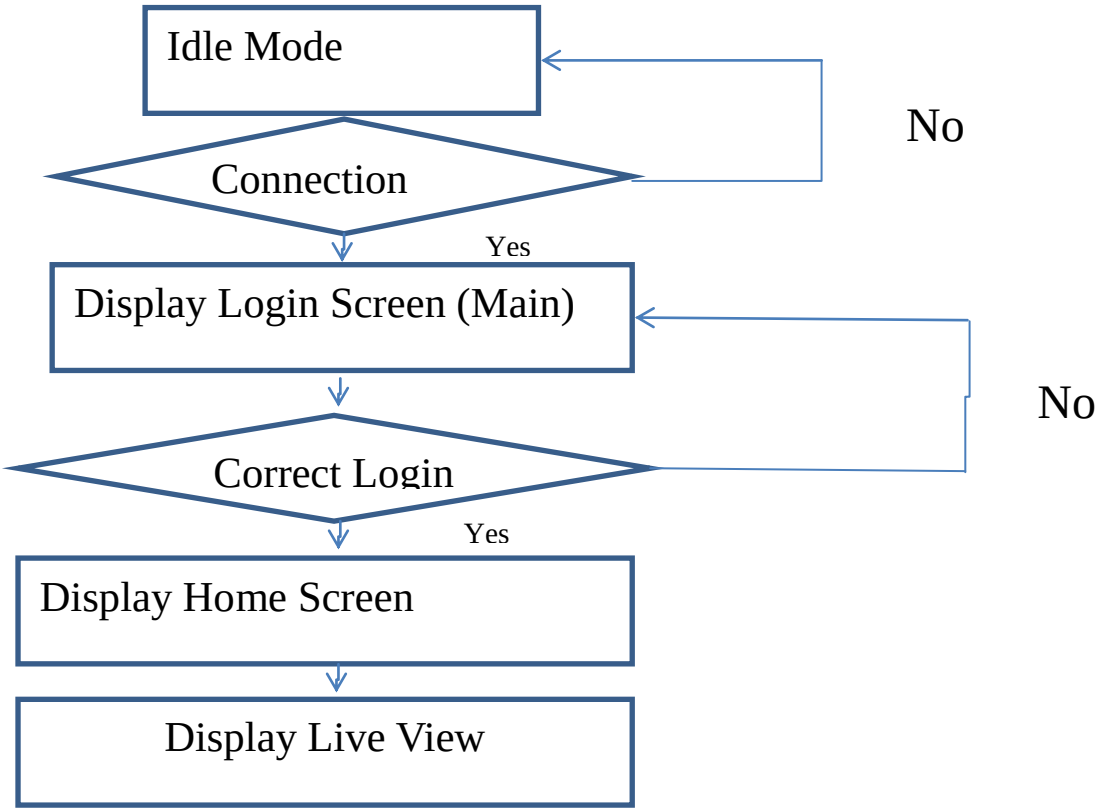


Figure 1.4: Server Flowchart

1.5 Android Programming using Eclipse

Since the Java Web Application Server (JSF) was created by using NetBeans IDE, to create the Android application, Eclipse is used. The Web application is encapsulated into an Android application. The project is then exported into APK to be installed using any Android Phone.

1.6 Server – Router Port-forwarding

The server will be located at home connected through a router. In order for the server to be connected from outside address, the router must first be set up to be able to port forwarded to the IP of the server in the enclosed network. This can be done by opening the router settings and add the IP of the server along with a certain port number. However, the IP address given by the ISP is dynamic, it will keep on changing.

1.7 Using DDNS for Dynamic IP

To assign a DDNS, firstly register a hostname with Dyndns.org, a username and a password are required. After the registration is completed, the hostname will automatically assigned to your current IP. To resolve the problem of the ever-changing IP address given by the ISP. The host name, username and password can be inserted to the router settings so that whenever the router is restarted (change IP), the router will inform dyndns.org the current IP. But by only using the host name registered, the current IP can be obtained.

1.8 Display

The image from the IP camera is obtained by requesting the image itself. This is done by the server to connect to the IP camera through TCP/IP. The user/client will then connect to the server using the Android Phone to gain access to the camera and enable the features of viewing their home remotely through TCP/IP.

1.8.1 Main Client Interface (Login)

Figure 1.5: Main Client Interface (Login)

1.8.2 Home Screen

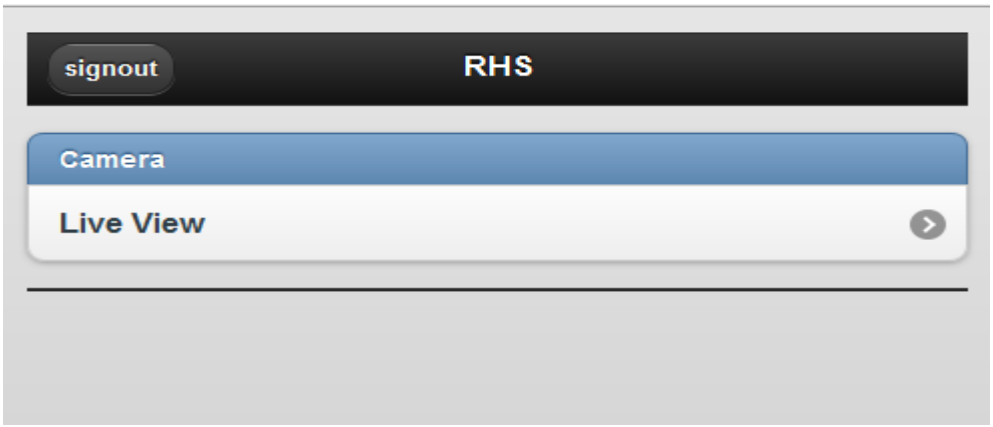


Figure 1.6: Home Screen

1.8.3 Live View

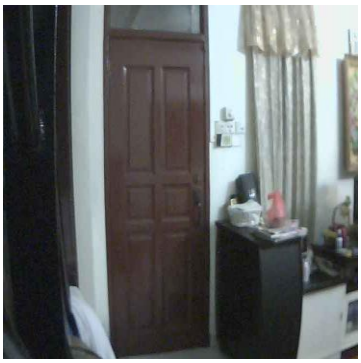


Figure 1.7: Live V

CONCLUSION

The ability to view our home remotely is essential to keep our home save from any unwanted activities such as burglary or other emergency situations. To view remotely a handheld device is needed such as an Android –platform phone. With the help of this program, the user can prevent any accidents, misfits, injury and many other things from occurring. The safety of our home and loved ones should be a number one priority.

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